TAC Meeting

NYSDEC / USEPA Region 2
Northrop Grumman Systems Corporation
NAVFAC

February 2, 2016

ARCADIS

Northrop Grumman Discussion Topics

- Status of Northrop Grumman/Navy Cooperation
  - Technical Exchange Meetings
  - Navy Wells sampled by Northrop Grumman
- Update on Northrop Grumman OU2 Activities
  - ONCT System OM&M
  - Groundwater Monitoring (TVOCs and 1,4-dioxane)
  - ONCT Effectiveness
- Update on Northrop Grumman OU3 Activities
  - Off-Site Groundwater Investigation
- NYSDEC Radiological Sampling Program

Status of Northrop Grumman/ Navy Cooperation

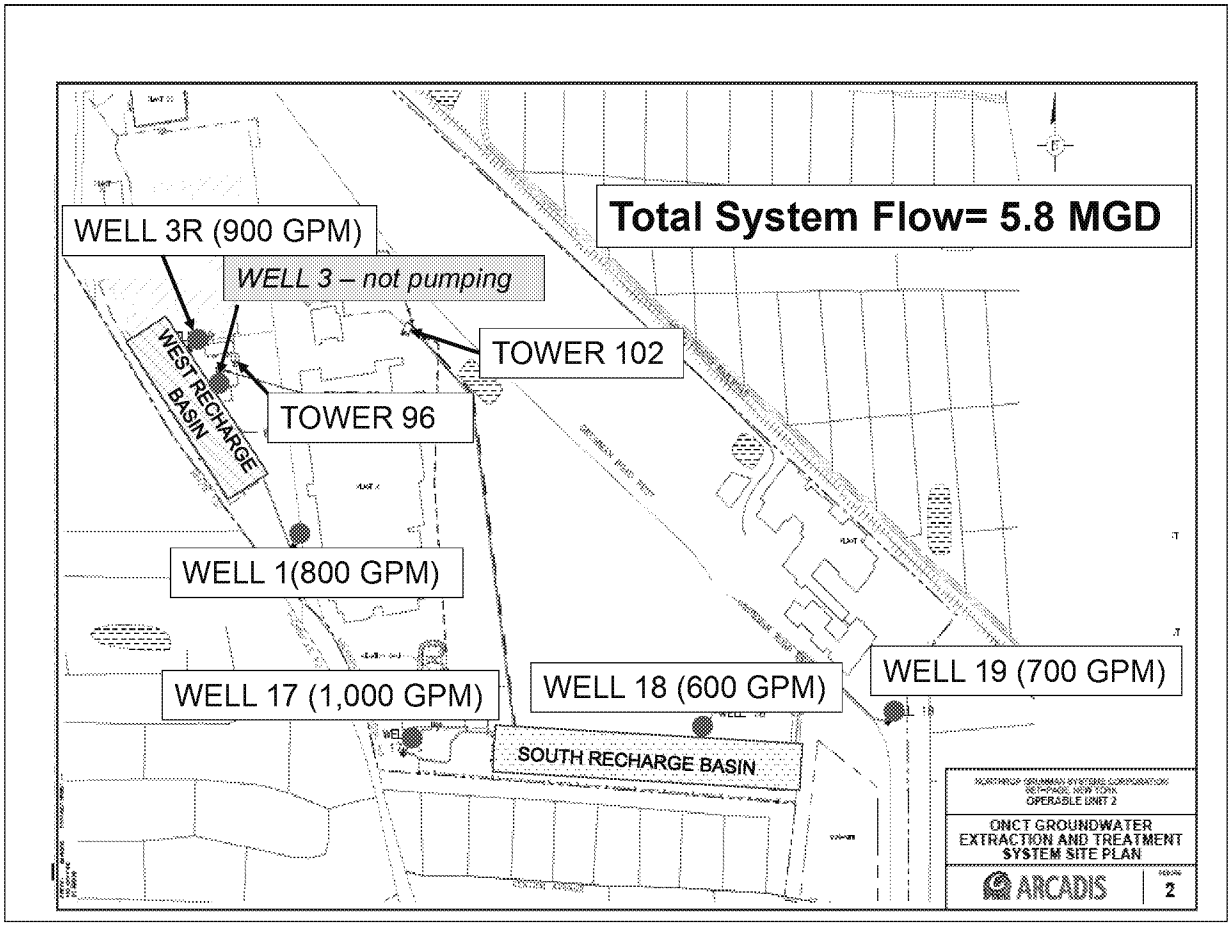
- Periodic Technical Exchange Meetings with Navy (August 11, 2015) – *Ongoing*
- Northrop Grumman continues sampling additional wells installed by Navy (per Navy request May 6, 2015) and provides results to Navy for reporting - *Ongoing*

Navy Wells Sampled by Northrop Grumman

- Sampled in 4Q-2015 and part of continuing program:
  - 13 outpost wells – quarterly frequency (MWD Northwest Well Field, SFWD Well Field 6)
  - 4 monitoring wells – semiannual frequency
- Planned to be sampled in 1Q-2016:
  - 13 outpost wells – quarterly frequency (MWD Northwest Well Field, SFWD Well Field 6)

Update on Northrop Grumman OU2 Activities

- ONCT System OM&M
- Groundwater Monitoring (TVOCs and 1,4-dioxane)
- ONCT Effectiveness


Total System Flow= 5.8 MGD
WELL 3R (900 GPM)
WELL 3 – not pumping
TOWER 102
TOWER 96
WEST RECHARGE BASIN
WELL 1(800 GPM)
WELL 17 (1,000 GPM)
WELL 18 (600 GPM)
WELL 19 (700 GPM)
SOUTH RECHARGE BASIN
OPERABLE UNIT 2
ONCT GROUNDWATER EXTRACTION AND TREATMENT SYSTEM SITE PLAN
ARCADIS
2

ONCT System OM&M

- Uptime & Performance (2015)
  - **T96 System: 98% uptime**

	% Uptime	% Design Flow
Well 1:	96	97
Well 3R:	98	133

  - **T102 System: 93% uptime**

	% Uptime	% Design Flow
Well 17:	93	94
Well 18:	91	94
Well 19:	93	96

ONCT System OM&M – cont'd

- Downtime due to alarm conditions, periodic system/well maintenance, and site-wide electrical and communications disruptions
  - Maintenance activities included T96 air stripper distribution tray cleaning, boiler maintenance, VFD repairs, carbon regen system repairs, meter calibration, equipment replacement, media replacement, and well head and drop pipe replacement
- ≥99% treatment efficiency, discharge is compliant
- Cumulative Mass Removal
  - 192,600 lbs VOCs removed from start up of ONCT System in 4Q 1998 through 4Q 2015

Groundwater Monitoring

- Summary of TVOCs and 1,4-dioxane results for 4Q-2015 by Hydrogeologic Zone (51 wells sampled)

Range of TVOCs and 1,4-dioxane in samples collected in Fourth Quarter 2015		
Hydrogeologic Zone	**Range of TVOCs (µg/L)**	**Range of 1,4-dioxane (µg/L)**
Shallow	ND - 6.9	ND - 5.5
Deep	ND - 150	ND - 6.6
Deep 2	ND - 450	ND - 7.8
Deep 3	ND - 86	ND - 1.3

Imagine the result

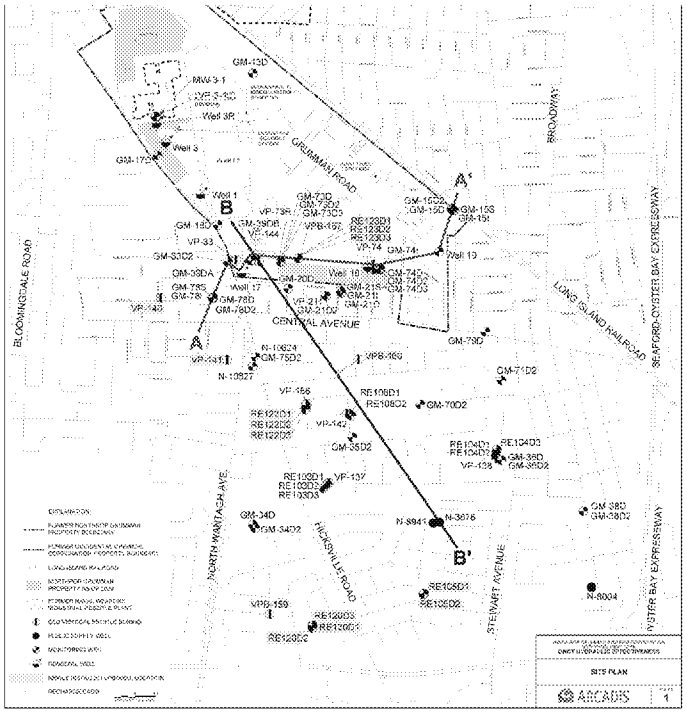
ARCADIS

51 wells sampled in 4Q-2015 include Northrop Grumman wells and the 15 original outpost wells repurposed for plume monitoring. Does not include Navy-owned wells Arcadis samples on behalf of Navy.

ONCT Effectiveness Update (2015)

The following data was added:

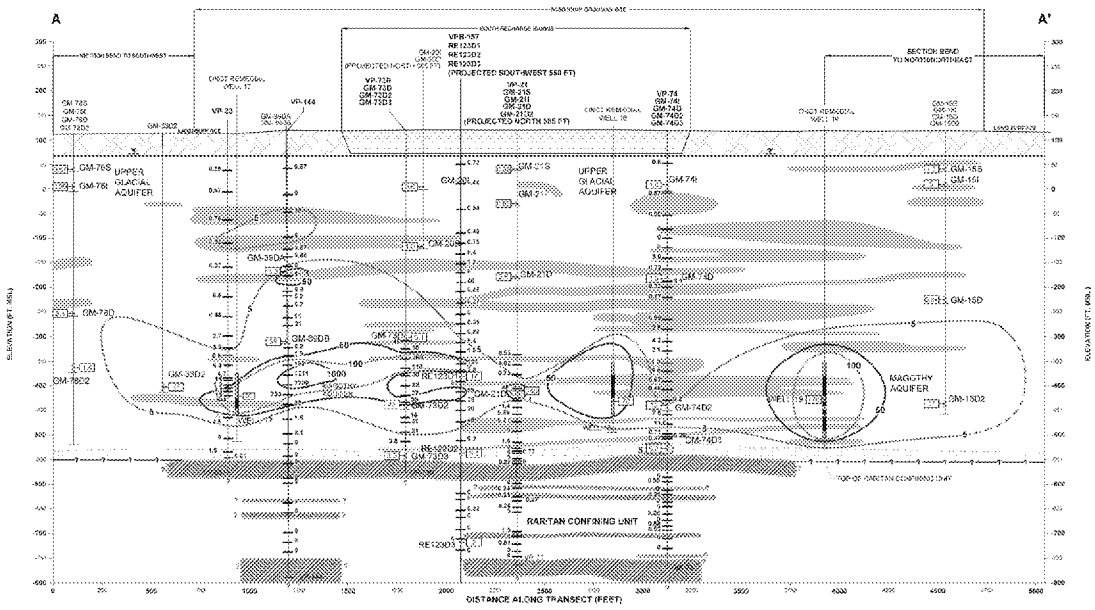
- 2015 groundwater quality data (Northrop Grumman and Navy)
- Data from newly-installed Navy VPBs and monitoring wells:
  - VPBs: 140, 141, 157, 159, 160
  - Monitoring Well Clusters: RE105, RE120, RE122, RE123



Well and Cross-section Locations

Imagine the result

ARCADIS

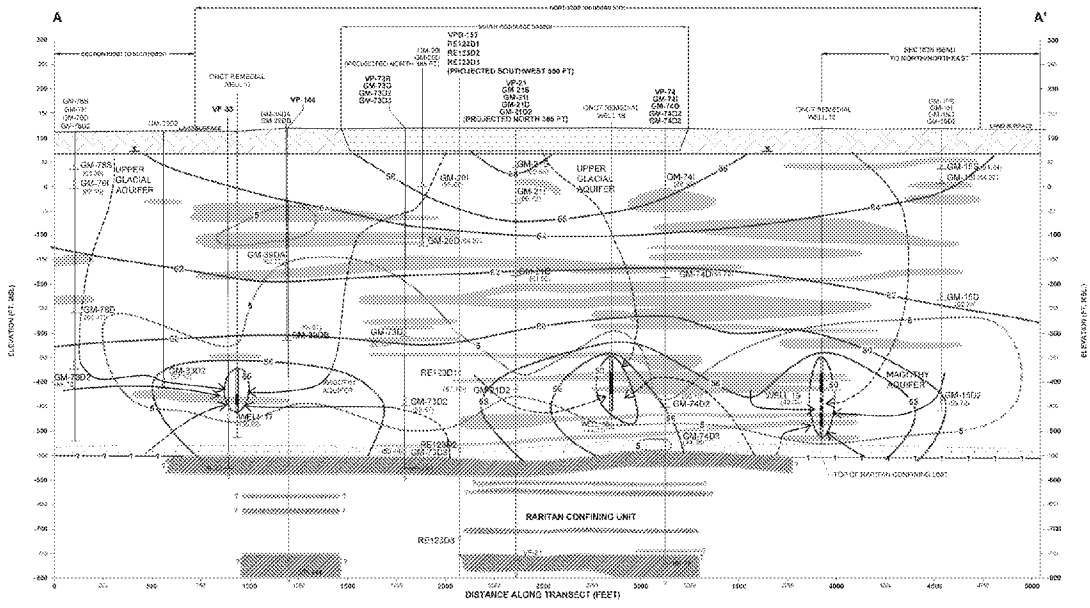


A-A' West to East TVOC Cross-Section

- Generally Groundwater has been Remediated Down to 300 ft bls

Imagine the result

ARCADIS

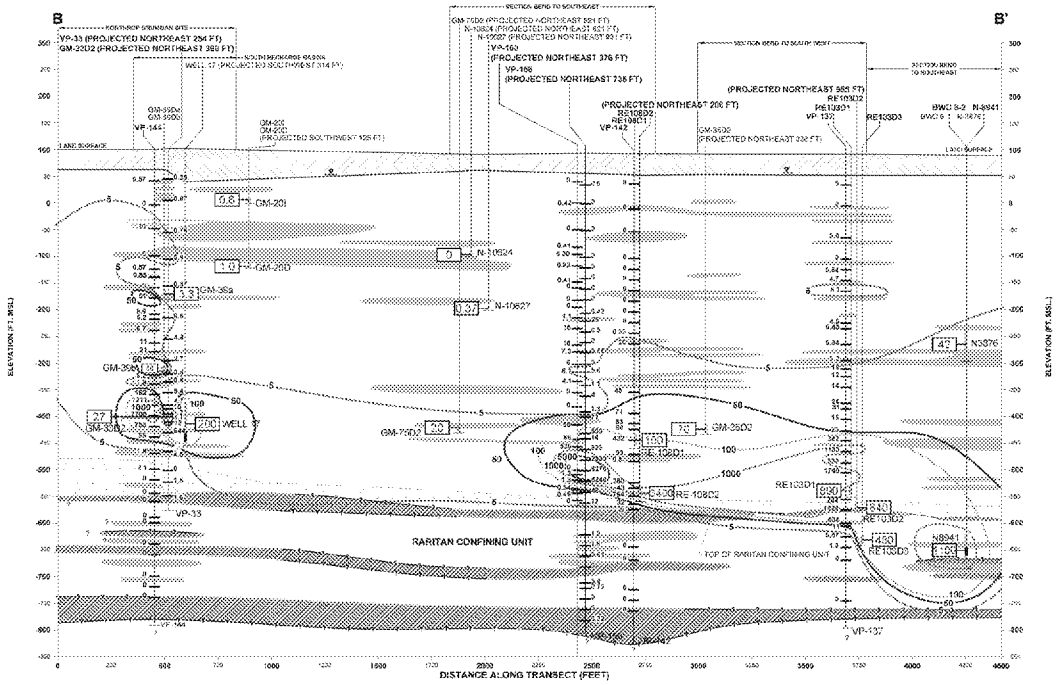


A-A' West to East Groundwater Flow Cross-Section

- ONCT System Capture Zone Extends to the "600 Foot" Clay

Imagine the result

ARCADIS



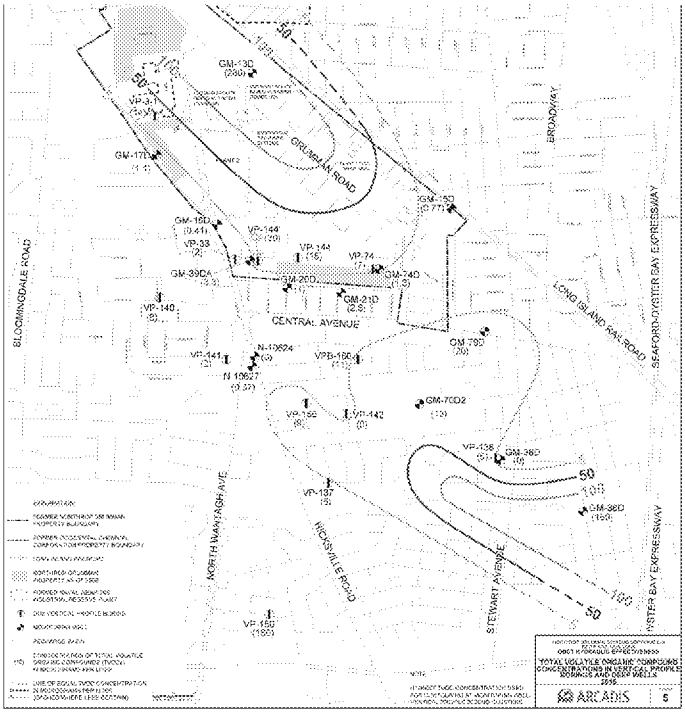
B-B' Northwest-Southeast TVOC Cross-Section

- Plume Bifurcation is Occurring which indicates ONCT System Effectiveness

Imagine the result

ARCADIS

Updated draft revision – test case

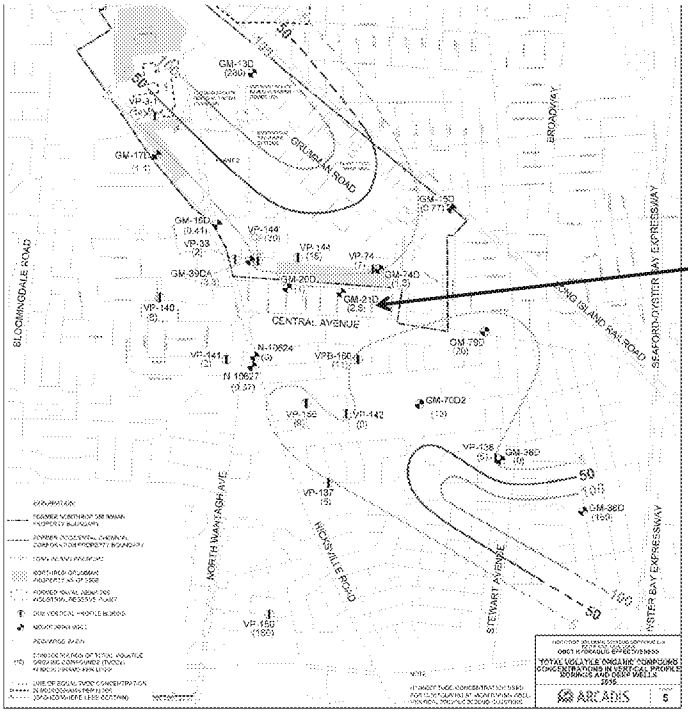


PLUME BIFURCATION
IS OCCURING

TVOCs in Deep Zone

Imagine the result

ARCADIS



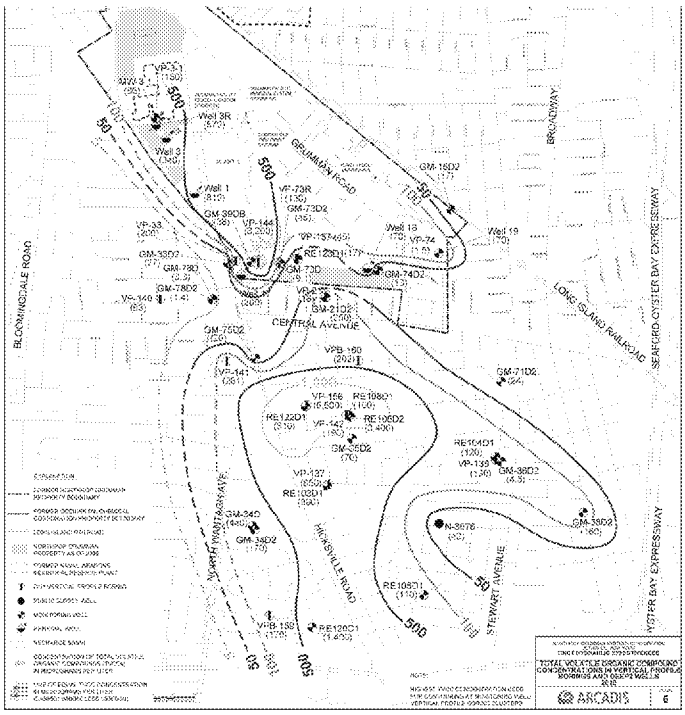
PLUME BIFURCATION IS OCCURING

GAP IN PLUME INDICATES ONCT SYSTEM EFFECTIVENESS

TVOCs in Deep Zone

Imagine the result

ARCADIS

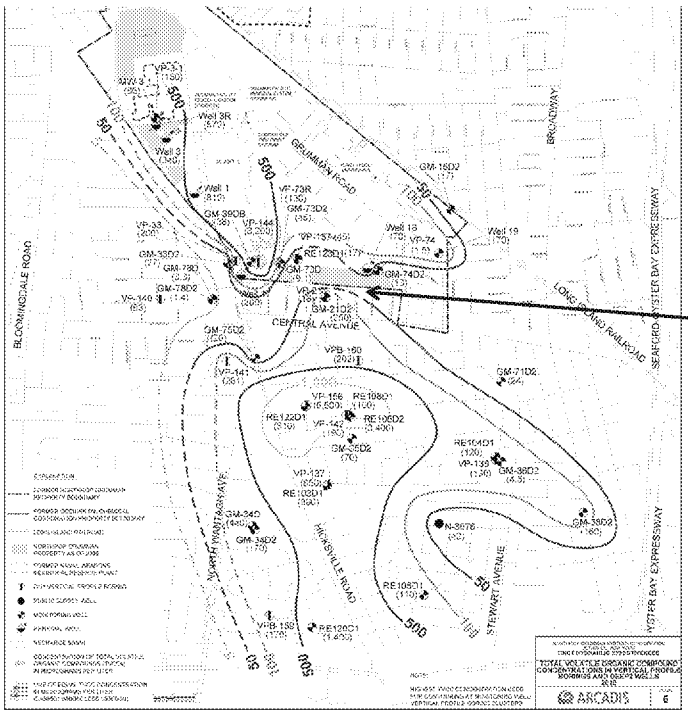


PLUME BIFURCATION
IS OCCURING

TVOCs in Deep 2 Zone

Imagine the result

ARCADIS



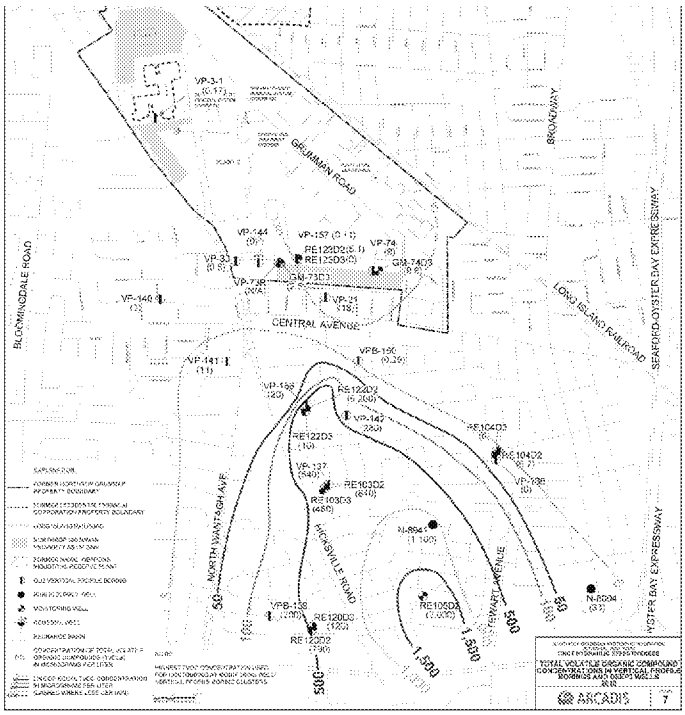
PLUME BIFURCATION IS OCCURING

GAP IN PLUME INDICATES ONCT SYSTEM EFFECTIVENESS

TVOCs in Deep 2 Zone

Imagine the result

ARCADIS

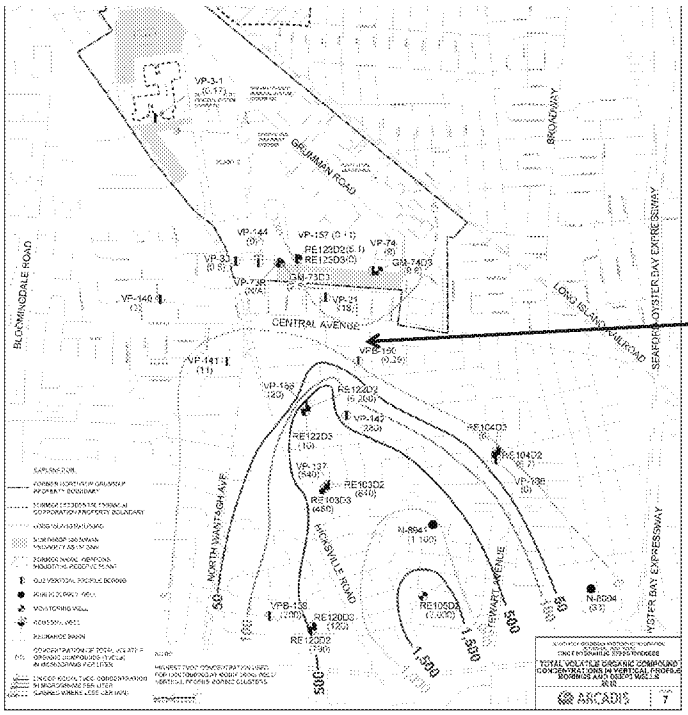


PLUME BIFURCATION
IS OCCURING

TVOCs in Deep 3 Zone

Imagine the result

ARCADIS



PLUME BIFURCATION IS OCCURING

GAP IN PLUME INDICATES ONCT SYSTEM EFFECTIVENESS

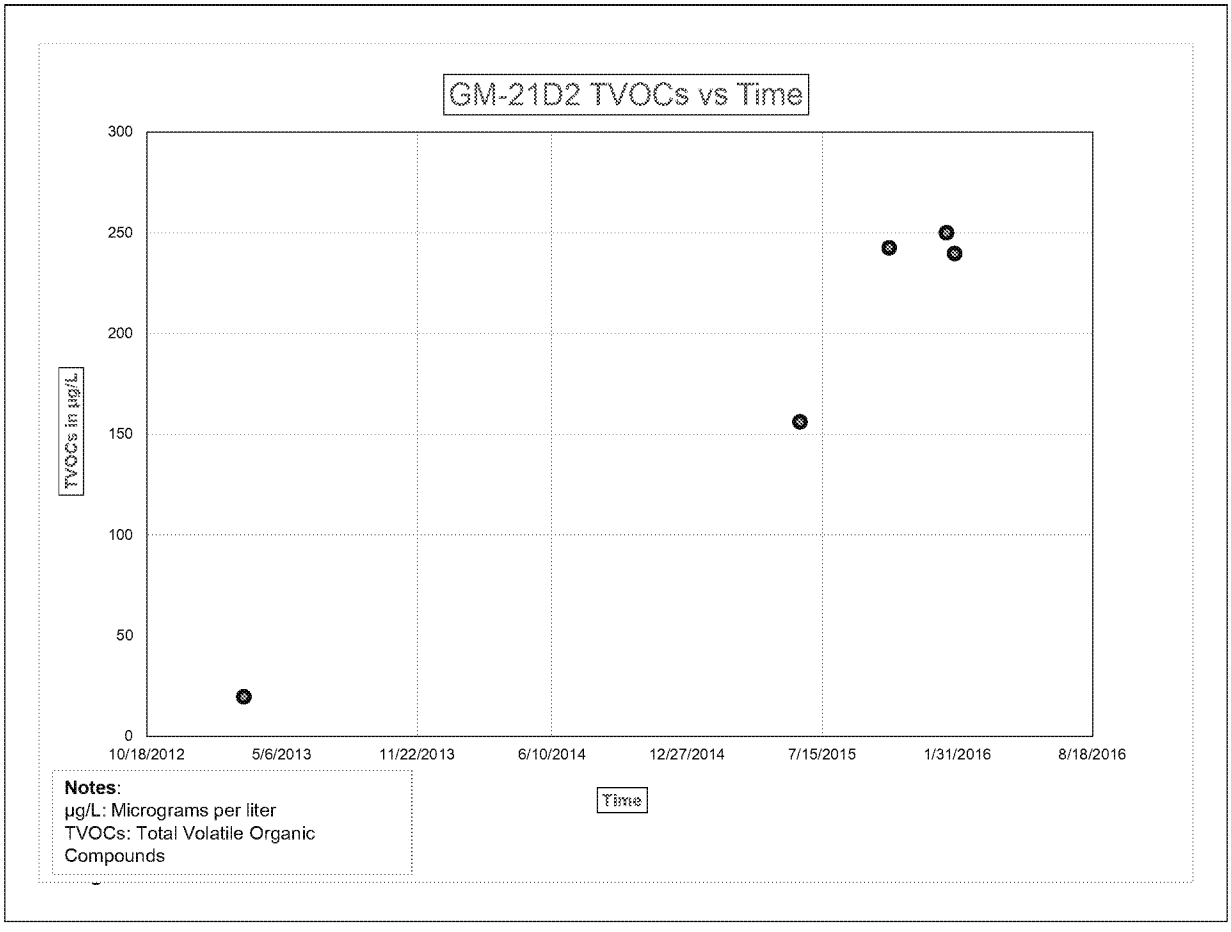
TVOCs in Deep 3 Zone

Imagine the result

ARCADIS

GM-21D2 Results/Related Study

- Well GM-21D2
  - Located southwest of ONCT Remedial Well 18, approximately 150 ft south of the Site
  - Located within the ONCT system capture zone (historical water level data)
- Results
  - Recent increases in TVOCs (2015) compared to previous sampling results (2013 initial sampling)


GM-21D2 TVOCs vs Time
300
250
200
150
100
50
0
TVOCs in µg/L
10/18/2012
5/6/2013
11/22/2013
6/10/2014
12/27/2014
7/15/2015
1/31/2016
8/18/2016
Time
Notes:
µg/L: Micrograms per liter
TVOCs: Total Volatile Organic Compounds

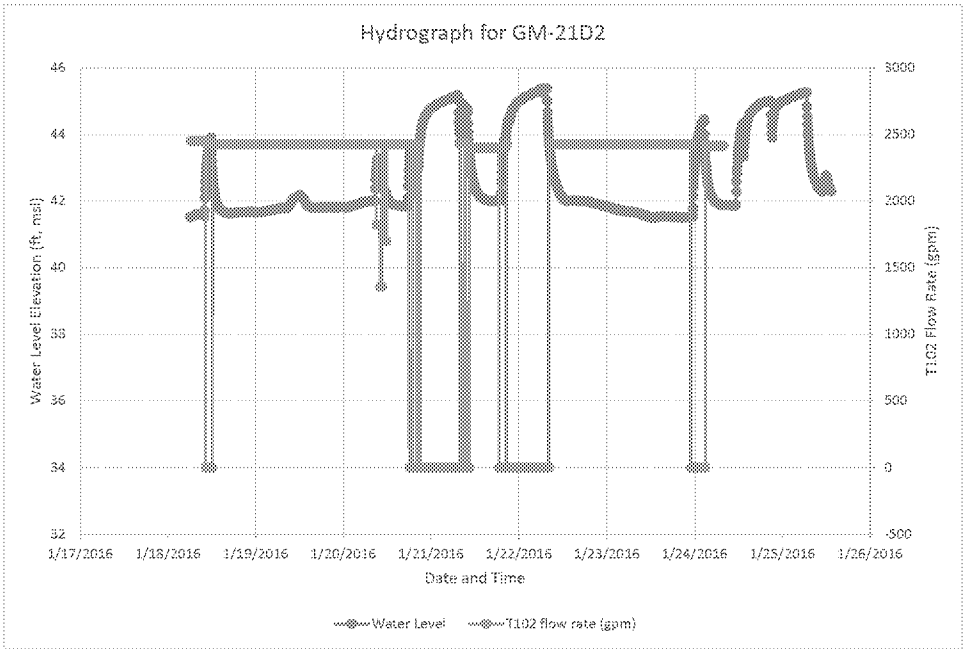
GM-21D2 Results/Related Study

- Possible scenarios causing results observed
  - Changes in groundwater conditions caused by one or more of the following:
    - Below normal precipitation/recharge in 2015 resulting in larger capture zone causing off-site impacted groundwater to be drawn back towards the ONCT system

GM-21D2 Results/Related Plan

- Plan to investigate/assess
  - Enhanced hydraulic and water quality monitoring
    - Monthly groundwater quality sampling at select wells for a period of six months
      - Monitoring Wells GM-21D2, GM-73D2, GM-74D2
      - Remedial Wells 17, 18, and 19
    - Monthly hydraulic (water-level) measurements (via direct measurement or by transducer) for a period of six months
      - Monitoring Wells GM-21D2, GM-33D2, GM-35D2, GM-71D2, GM-73D2, GM-74D2, GM-75D2 and Remedial Wells 17, 18, and 19

GM-21D2 Water-Levels



Assessing hydraulic connection with remedial wells

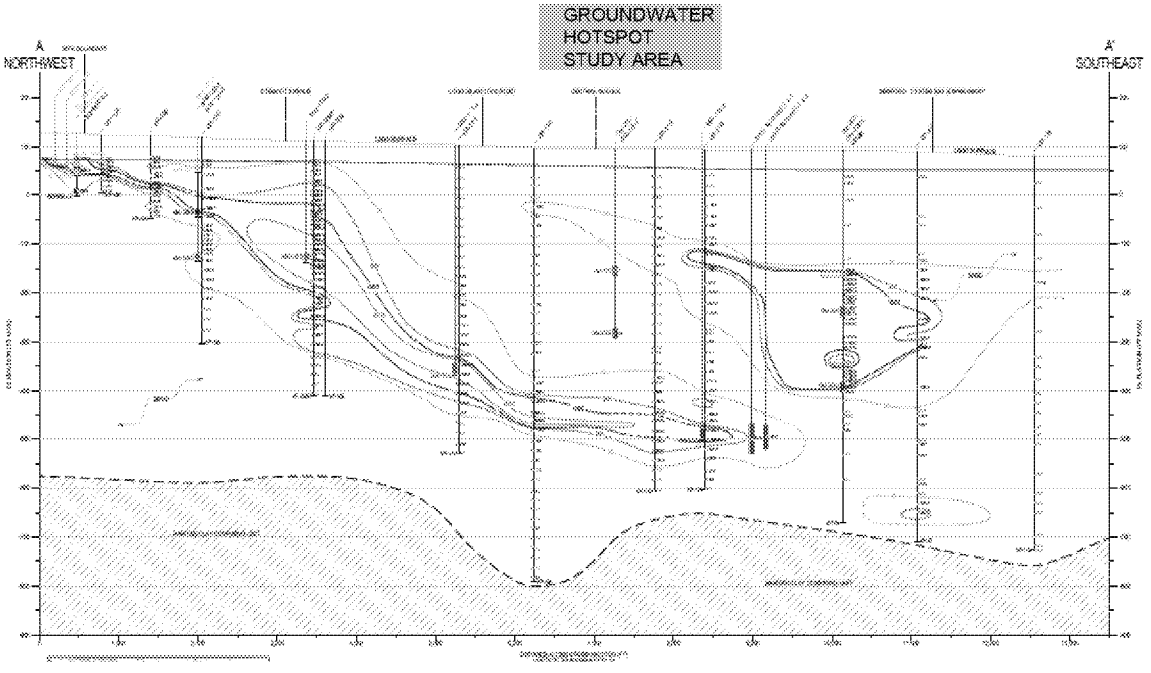
Imagine the result

ARCADIS

Update on Northrop Grumman OU3 Activities (Off-Site Groundwater Investigation)

- Locations of VPBs and Monitoring Wells
- VOC/1,4-Dioxane Results

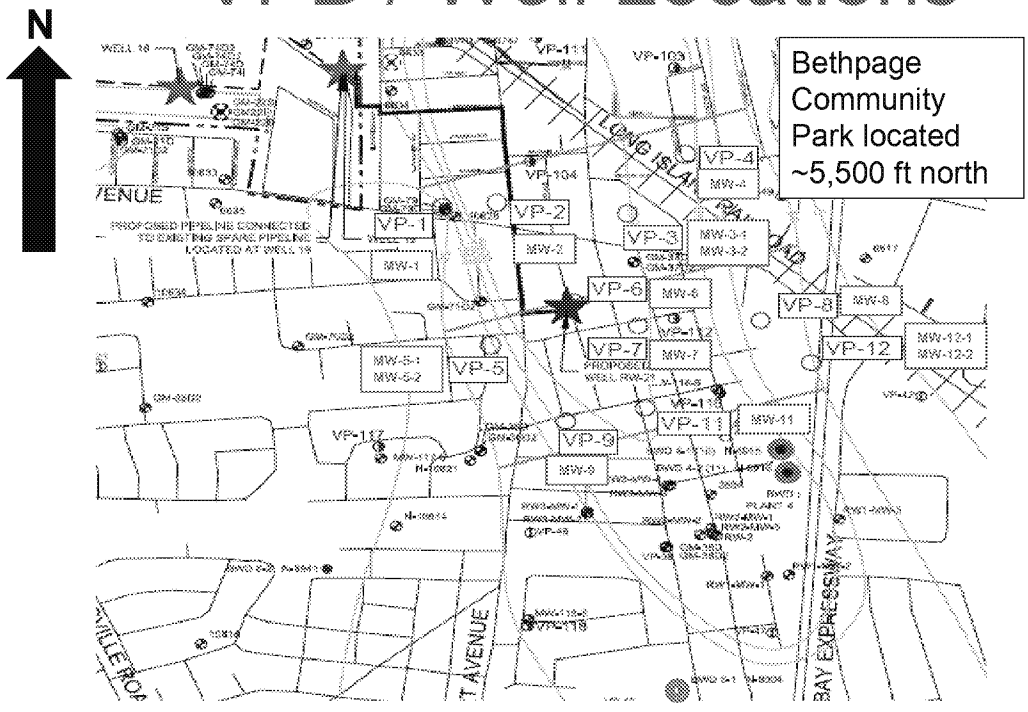
Study Area RI X-Section



Imagine the result

ARCADIS

VPB / Well Locations



Imagine the result

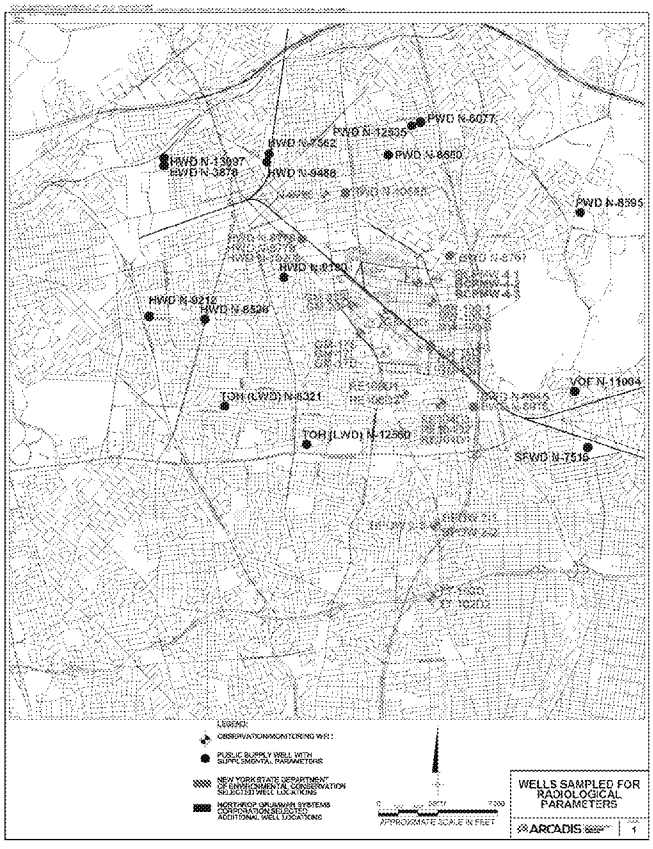
ARCADIS

Summary of Results

VPB ID	VPB Total Depth (ft bls)	Monitoring Well ID	Screened Interval (ft bls)	Max VPB Interval TVOC (ug/L)	Post Development Mon. Well TVOC (ug/L)	Dec-2015 Mon. Well TVOC (ug/L)	Dec-2015 Mon. Well 1,4-dioxane (ug/L)
RW-21_VP-1	761	RW-21_MW-1	615 – 625	859	3,904	3,000	23
RW-21_VP-2	742	RW-21_MW-2	600 – 610	105	4,584	3,000	27
RW-21_VP-3	860	RW-21_MW-3-1 RW-21_MW-3-2	556 - 566 595 - 605	14,113 4,897	14,700 5,464	9,900 3,400	114 43
RW-21_VP-4	710	RW-21_MW-4	369 - 384	989	973	440	4.7
RW-21_VP-5	716	RW-21_MW-5-1 RW-21_MW-5-2	300 - 310 560 - 570	140 23	90 37	50 22	4.5 1.3
RW-21_VP-6	742	RW-21_MW-6	604 - 624	1,645	3,660	2,300	16
RW-21_VP-7	827	RW-21_MW-7	580 - 590	5,252	5,906	7,100	75
RW-21_VP-8	700	RW-21_MW-8	460 – 470	430	942	810	8.4
RW-21_VP-9	706	RW-21_MW-9	630 - 640	400	860	650	5.9
RW-21_VP-11	817	RW-21_MW-11	638 - 648	1,956	1,992	1,400	6.6
RW-21_VP-12	700	RW-21_MW-12-1 RW-21_MW-12-2	415 – 425 590 - 600	96 6	126 ND	130 ND	4.7 ND

NYSDEC Radiological Sampling Program

- Northrop Grumman supported sampling of 17 monitoring wells (10/1 thru 10/9/2015)
- Northrop Grumman worked with NYSDEC to coordinate sampling of public supply wells (December 2015)
  - Included 7 public supply wells sampled by NYSDEC for radiological parameters and by Northrop Grumman for other parameters of regional interest (VOCs and 1,4-dioxane)
  - Included 15 additional public supply wells sampled by Northrop Grumman for radiological parameters and other parameters of regional interest (VOCs and 1,4-dioxane)



Imagine the result

ARCADIS

NYSDEC Radiological Sampling Program

- Northrop Grumman's radiological, VOC, and 1,4-dioxane results to be submitted to participating water districts and NYSDEC in Feb-2016
- Water Districts:
  - Bethpage Water District
  - Plainview Water District
  - Hicksville Water District
  - TOH-Levittown Water District
  - South Farmingdale Water District
  - Village of Farmingdale